What is claimed is:

1. An optical pickup apparatus comprising:

a first light source for emitting a first light flux with a first wavelength $\lambda 1$ of 450 nm or less;

a second light source for emitting a second light flux with a second wavelength $\lambda 2$ which is 1.3 times longer than the wavelength of the first wavelength $\lambda 1$;

an objective lens unit to converge the first light flux emitted by the first light source onto a first information recording surface of a first optical disk and to converge the second light flux emitted by the second light source onto a second information recording surface of a second optical disk with a different recording density from that of the first optical disk;

a spherical aberration correcting optical unit which is arranged between both of the first light source and the second light source and the objective lens unit and is arranged in a common optical path of the first light flux and the second light flux; and

a chromatic aberration correcting optical element which is arranged in the common optical path of the first light

flux and the second light flux and includes a diffractive surface on at least one of optical surfaces of the chromatic aberration correcting optical element such that a diffractive structure which is constructed by a plurality of ring-shaped zones separated by fine steps is formed on the diffractive surface,

wherein the depth of steps along an optical axis is designed so that n2 which is a diffraction order of a diffracted ray having a largest diffraction efficiency among diffracted rays caused when the second light flux enters into the diffractive structure, is lower order than n1 which is a diffraction order of a diffracted ray having a largest diffraction efficiency among diffracted light rays caused when the second light flux enters into the diffractive structure.

2. The optical pickup apparatus of claim 1, wherein the spherical aberration correcting optical unit changes a slope angle of a marginal ray in an incident light flux to the objective lens unit by variably adjusting an interval between at least one lens group among lens groups composing the spherical aberration correcting optical unit and the objective lens unit.

3. The optical pickup apparatus of claim 1, wherein the chromatic aberration correcting optical element is arranged between both of the first light source and the second sources and the objective lens unit.

4. The optical pickup apparatus of claim 3, wherein the spherical aberration correcting optical unit comprises the chromatic aberration correcting optical element.

5. The optical pickup apparatus of claim 1, wherein the objective lens unit comprises the chromatic aberration correcting optical element.

6. The optical pickup apparatus of claim 1, wherein the optical pickup apparatus further comprises at least a coupling lens for converting a divergence angle of a light flux emitted by the first light source and introducing the converted light flux into the objective lens unit, and the spherical aberration correcting optical unit comprises the coupling lens and an expander lens including a positive lens group and a negative lens group and arranged in an optical path between the coupling lens and the objective lens unit.

7. The optical pickup apparatus of claim 1, wherein the spherical aberration correcting optical unit is a coupling lens for converting a divergence angle of a light flux emitted by the first light source and the second light source and introducing the converted light flux into the objective lens unit.

8. The optical pickup apparatus of claim 1, wherein the spherical aberration correcting optical unit includes a structure in which electrodes and a liquid crystal molecule layer are laminated alternately so that a refractive index distribution of the liquid crystal molecule layer is changed by applying a pre-defined voltage to the electrodes.

9. The optical pickup apparatus of claim 8, wherein the objective lens unit united with the spherical aberration correcting optical unit into one body performs a tracking operation.

10. The optical pickup apparatus of claim 1, wherein the spherical aberration correcting optical unit corrects a spherical aberration caused in the objective lens unit due to

a wavelength difference between the first wavelength λ1 and the second wavelength λ2.

11. The optical pickup apparatus of claim 1, wherein the spherical aberration correcting optical unit corrects a spherical aberration caused by a variation of the first wavelength λ1 in case that the first wavelength λ1 varies in the range of ± 10 nm.

12. The optical pickup apparatus of claim 1, wherein a recording density of the first optical disk is larger than that of the second optical disk, the first optical disk includes a first protective layer on a first information recording surface thereof, and the spherical aberration correcting optical unit corrects a spherical aberration caused by a thickness error of the first protective layer.

13. The optical pickup apparatus of claim 1, wherein a recording density of the first optical disk is larger than that of the second optical disk, the first optical disk includes a multi-layer structure in which optical transparent layers and information recording surfaces are alternatively

laminated in this order from the light source side, and the spherical aberration correcting optical unit corrects a spherical aberration which is caused when the objective lens unit makes its focus jump from an i-th information recording surface to a j-th information recording surface, where i is an arbitral integer satisfying $1 \leq i \leq n$, j is an arbitral integer satisfying $1 \leq j \leq n$, j is a different from i, and respective information recording surfaces in the multi-layer structure are supposed as first information recording surface, a second information recording surface, ..., and an n-th information recording surface in this order from an information recording surface nearest to the light sources.

14. The optical pickup apparatus of claim 1, wherein a recording density of the first optical disk is larger than that of the second optical disk, the first optical disk includes a first protective layer with a thickness of t1 on a first information recording surface, the second optical disk includes a second protective layer with a thickness of t2 ($t1 < t2$) on a second information recording surface, the spherical aberration correcting optical unit corrects a spherical aberration caused by a thickness difference between a thickness of the first layer and that of the second layer.

15. The optical pickup apparatus of claim 1, wherein the objective lens unit includes at least one of a plastic lens, the spherical aberration correcting optical unit corrects a refractive index variation resulting from an environmental temperature variation in the plastic lens included in the objective lens unit and/or a spherical aberration resulting from a refractive index distribution caused by a temperature distribution in the plastic lens.

16. The optical pickup apparatus of claim 1, wherein a recording density of the first optical disk is larger than that of the second optical disk, the first optical disk includes a first protective layer on a first information recording surface thereof,

a first magnification and a second magnification are different from each other where the first magnification is a magnification of the objective lens unit when information recording and/or reproducing is conducted on the first optical disk and the second magnification is a magnification of the objective lens unit when information recording and/or reproducing is conducted on the second optical disk,

and the spherical aberration correcting optical unit changes

an objective point position of the objective lens unit corresponding to a difference of the first magnification and the second magnification.

17. The optical pickup apparatus of claim 1, wherein the second wavelength $\lambda 2$ is in the range of 600 nm - 700 nm and a combination of the diffraction order n1 and n2 is one of the followings:

(n1, n2) = (2, 1), (3, 2), (4, 2), (5, 3), (6, 4), (7, 4), (8, 5), (10, 6).

18. The optical pickup apparatus of claim 1, wherein the optical pickup apparatus further comprises a third light source for emitting a third wavelength $\lambda 3$ which is different from the first and second wavelengths,
the objective lens unit converges a third light flux emitted from the third light source onto a third information recording surface of the third optical disk with different recording density from those of the first and the second optical disks,
the chromatic aberration correcting optical unit is arranged in a common optical path of the first to third light fluxes,

the second wavelength $\lambda 2$ is in the range of 600 nm - 700 nm, the third wavelength $\lambda 3$ is in the range of 730 nm - 830 nm, and the chromatic aberration correcting optical unit satisfies one of the following combinations:

(n1, n2, n3) = (2, 1, 1), (4, 2, 2), (6, 4, 3), (8, 5, 4), (10, 6, 5)

where n1, n2 and n3 are diffraction orders of diffracted rays with largest diffraction efficiencies in diffracted rays when the fist, second and third light fluxes enter into the chromatic aberration correcting optical element respectively.

19. The optical pickup apparatus of claim 1, wherein the optical pickup apparatus includes a coupling lens for converting divergence angles of the first light flux emitted by the first light source and the second light flux emitted by the second light source and introducing the light fluxes into the objective lens unit, and the coupling lens includes the chromatic aberration correcting optical element.

20. The optical pickup apparatus of claim 19, wherein the coupling lens comprises at least one of a plastic lens and a diffractive surface of the chromatic aberration correcting

optical element further has a function for suppressing a divergence angle variation in response to a temperature variation or a converging angle variation in response to a temperature variation for the first light flux emitted from the coupling lens.

21. The optical pickup apparatus of claim 20, wherein a recording density of the first optical disk is larger than that of the second optical disk, the coupling lens is a one-group plastic lens and the optical pickup apparatus satisfies the following formula:

$$\{NA1 \cdot (1 - m1)\}^4 \cdot (f1^2 / f_C) \cdot | c1 + (c2 - c1) \cdot P_D / P_C | < 0.13 \cdot \lambda1$$

where NA1 is a numerical aperture of the objective lens unit at the time of information recording and/or representing on the first optical disk, m1 is a magnification of the objective lens unit at the time of information recording and/or representing on the first optical disk, f1 (mm) is a focal length of the objective lens unit for the first wavelength λ1 at the time of information recording and/or representing on the first optical disk, λ1 (mm) is the first wavelength, f_C is a focal length of the coupling lens for the

first wavelength $\lambda 1$, n is a refractive index of the coupling lens for the first wavelength $\lambda 1$, α is a linear expansion coefficient of the coupling lens, P_D (mm^{-1}) is a paraxial power of the diffractive surface for the first wavelength $\lambda 1$, P_C (mm^{-1}) is a paraxial power of the coupling lens for the first wavelength $\lambda 1$, $dn/d\lambda$ is a change rate in a refractive index resulting from a temperature variation in the coupling lens, $d\lambda/dt$ is a wavelength change rate resulting from the temperature variation, and c1 and c2 are defined by the following formulas:

$$c1 = 1 / (n - 1) \cdot dn/dt + 1 / (n - 1) \cdot dn/d\lambda \cdot d\lambda/dt - \alpha$$

$$c2 = 1 / \lambda 1 \cdot d\lambda/dt - 2\alpha$$

and when an added optical path length caused by the diffractive structure is defined by and optical path difference function represented by the formula:

$$P_D = -2 \cdot n1 \cdot B_2 \cdot (\lambda 1 / \lambda B)$$

and n1 is a diffraction order of a diffracted ray with a largest diffraction efficiency among diffracted rays caused in the case that the first light flux enters into the diffractive structure, P_D is defined by an added optical path length quantity caused by the following formula:

$$\phi_b = n \times (\lambda / \lambda B) \times \sum_{j=0} B_{2j} h^{2j}$$

where h (mm) is a height in perpendicular direction to the optical path, $B2_j$ is an optical path difference function coefficient, n is a diffraction order of a diffracted ray with a largest diffraction efficiency among diffracted rays of an incident light flux, λ (nm) is a wavelength of an incident light flux to the diffractive structure and λB (nm) is a construction wavelength (or a blazed wavelength) of the diffractive structure.

22. The optical pickup apparatus of claim 21 which satisfies the following formula:

$$| c1 + (c2 - c1) \cdot P_D / P_C | / f_C < 0.08 \cdot \lambda 1 \text{ (mm)}$$

23. The optical pickup apparatus of claim 1, wherein the chromatic aberration correcting optical element comprises at least an optical surface with negative paraxial power and is an one-group optical element which is conducted the first light flux almost parallel to the optical axis and emits an almost parallel light flux.

24. The optical pickup apparatus of claim 1, wherein the objective lens unit comprises at least two kinds of objective lenses which are a first objective lens for recording and/or reproducing information on an optical disk with a pre-defined recording density and a second objective lens for recording and/or reproducing information on another optical disk than the optical disk with the pre-defined recording density, and a switching mechanism for selectively switching these objective lenses.

25. The optical pickup apparatus of claim 1, wherein the recording density of the first optical disk is larger than that of the second optical disk and a numerical aperture of the objective lens unit in case that information recording and/or reproducing is conducted on the first optical disk is 0.8 and more.

26. The optical pickup apparatus of claim 1, wherein the recording density of the first optical disk is larger than that of the second optical disk, a first protective layer has a thickness in the range of 0.07 mm - 0.13 mm on the first information surface on the first optical disk, the second protective layer has a thickness in the range of 0.55 mm -

0.65 mm on the second information surface of the second optical disk, and the optical pickup apparatus conducts recording and/or reproducing information on the first optical disk and the second optical disk resulting from converging the first light flux on each of the information recording surfaces of the first optical disk and the second optical disk

27. The optical pickup apparatus of claim 3, wherein the optical pickup apparatus further comprises a third light source for emitting a third light flux with a wavelength $\lambda 3$ (730 nm $\leq \lambda 3 \leq$ 830 nm), the objective lens unit converges the third light flux onto a third information recording surface of the third optical disk and the third light flux enters into the objective lens unit without passing trough the chromatic aberration correcting optical element.

28. An optical information recording and reproducing apparatus which comprises the optical pickup apparatus of claim 1 and is adapted to conduct at least one of recording information on the first and second optical disks and

reproducing information recorded on the first and second optical disks.

29. An expander lens for an optical pickup apparatus comprising

a first light source for emitting a first light flux with a first wavelength λ1 of 450 nm or less;

a second light source for emitting a second light flux with a second wavelength λ2 which is 1.3 times longer than the wavelength of the first wavelength λ1;

an objective lens unit to converge the first light flux emitted by the first light source onto a first information recording surface of a first optical disk and to converge the second light flux emitted by the second light source onto a second information recording surface of a second optical disk with a different recording density from that of the first optical disk,

wherein the expander lens is arranged between both of the first light source and the second light source and the objective lens unit and in a common optical path of the first light flux and the second light flux,

the expander lens includes a positive lens group and a

negative lens group;
comprises a chromatic aberration correcting optical element which includes a diffractive surface on at least one of optical surfaces of the chromatic aberration correcting optical element such that a diffractive structure which is constructed by a plurality of ring-shaped zones separated by fine steps is formed on the diffractive surface;
designed so that a diffracted ray with a diffraction order n2 having a largest diffraction efficiency among diffracted rays when the second light flux enters into the diffractive structure, has lower order than a diffracted ray with a diffraction order n1 having a largest diffraction efficiency among diffracted light rays when the second light flux enters into the diffractive structure; and
changes a slope angle of a marginal ray in an incident light flux to the objective lens unit by variably adjusting an interval between at least one lens group of lens groups composing the spherical aberration correcting optical unit, and the objective lens unit.

30. The expander lens of claim 29, wherein the second wavelength $\lambda 2$ is in the range of 600 nm - 700 nm and a combination of the diffraction order n1 and n2 is one of the

followings:

(n1, n2) = (2, 1), (3, 2), (4, 2), (5, 3), (6, 4), (7, 4), (8, 5), (10, 6).

31. The expander lens of claim 30, wherein a refractive index of a lens constructing the chromatic aberration correcting optical element and including the diffracted surface for the first wavelength $\lambda 1$ is in the range of 1.5 - 1.6, Abbe number for d line (wavelength 587.6 nm) is the range of 50 - 60 and the depth d0 of a step which is along an optical axis and closest to the optical axis satisfies one of the followings:

(1) 1.2 μm < d0 < 1.7 μm

(2) 1.9 μm < d0 < 2.6 μm

(3) 2.6 μm < d0 < 3.2 μm

(4) 3.3 μm < d0 < 4.2 μm

(5) 4.4 μm < d0 < 5.0 μm

(6) 4.7 μm < d0 < 5.7 μm

(7) 5.6 μm < d0 < 6.5 μm

(8) 6.9 μm < d0 < 8.1 μm

32. The expander lens of claim 29, wherein the optical pickup apparatus further comprises a third light source for emitting a third wavelength λ3 which is different from the first and second wavelengths,

the objective lens unit converges a third light flux emitted from the third light source onto a third information recording surface of the third optical disk with different recording density from that of the first and the second optical disk,

the chromatic aberration correcting optical unit is arranged in a common optical path of the first to third light fluxes,

the second wavelength λ2 is in the range of 600 nm - 700 nm,

the third wavelength λ3 is in the range of 730 nm - 830 nm,

and the chromatic aberration correcting optical unit satisfies one of the following combinations:

(n1, n2, n3) = (2, 1, 1), (4, 2, 2), (6, 4, 3), (8, 5, 4), (10, 6, 5)

where n1, n2 and n3 are diffraction orders of diffracted rays with largest diffraction efficiencies in diffracted rays when the fist, second and third light fluxes enter into the chromatic aberration correcting optical element, respectively.

33. The expander lens of claim 32, wherein a refractive index for the first wavelength λ1 of a lens constructing the chromatic aberration correcting optical element and including the diffracted surface is in the range of 1.5 - 1.6, Abbe number for d line (wavelength 587.6 nm) is the range of 50 - 60 and the depth d0 of a step which is along an optical axis and closest to the optical axis satisfies one of the followings:

(9) $1.2\ \mu m < d0 < 1.7\ \mu m$

(10) $2.6\ \mu m < d0 < 3.2\ \mu m$

(11) $4.4\ \mu m < d0 < 5.0\ \mu m$

(12) $5.6\ \mu m < d0 < 6.5\ \mu m$

(13) $6.9\ \mu m < d0 < 8.1\ \mu m$

34. A coupling lens for an optical pickup apparatus comprising

a first light source for emitting a first light flux with a first wavelength λ1 of 450 nm or less;

a second light source for emitting a second light flux with a second wavelength λ2 which is 1.3 times longer than the wavelength of the first wavelength λ1;

an objective lens unit to converge the first light flux emitted by the first light source onto a fiest information recording surface of a first optical disk and to converge the second light flux emitted by the second light source onto a second information recording surface of a second optical disk with different recording density from that of the first optical disk,

wherein the coupling lens is arranged between both of the first light source and the second light source and the objective lens unit and in a common optical path of the first light flux and the second light flux,

comprises a chromatic aberration correcting optical element which includes a diffractive surface on at least one of optical surfaces of the chromatic aberration correcting optical element such that a diffractive structure which is constructed by a plurality of ring-shaped zones separated by fine steps is formed on the diffractive surface;

designed so that a diffracted ray with a diffraction order n2 having a largest diffraction efficiency among diffracted rays when the second light flux enters into the diffractive structure, has lower order than a diffracted ray with a diffraction order n1 having a largest diffraction efficiency among diffracted light rays when the second light flux enters

into the diffractive structure; and
changes a slope angle of a marginal ray in an incident light flux to the objective lens unit by variably adjusting an interval between at least one lens group of lens groups composing the spherical aberration correcting optical unit, and the objective lens unit.

35. The coupling lens of claim 34, wherein the second wavelength $\lambda 2$ is in the range of 600 nm - 700 nm and a combination of the diffraction order n1 and n2 is one of the followings:

(n1, n2) = (2, 1), (3, 2), (4, 2), (5, 3), (6, 4), (7, 4), (8, 5), (10, 6).

36. The coupling lens of claim 35, wherein a refractive index for the first wavelength $\lambda 1$ of a lens constructing the chromatic aberration correcting optical element and including the diffracted surface is in the range of 1.5 - 1.6, Abbe number for d line (wavelength 587.6 nm) is the range of 50 - 60 and the depth d0 of a step which is along an optical axis and closest to the optical axis satisfies one of the

followings:

(1) $1.2\ \mu m < d0 < 1.7\ \mu m$

(2) $1.9\ \mu m < d0 < 2.6\ \mu m$

(3) $2.6\ \mu m < d0 < 3.2\ \mu m$

(4) $3.3\ \mu m < d0 < 4.2\ \mu m$

(5) $4.4\ \mu m < d0 < 5.0\ \mu m$

(6) $4.7\ \mu m < d0 < 5.7\ \mu m$

(7) $5.6\ \mu m < d0 < 6.5\ \mu m$

(8) $6.9\ \mu m < d0 < 8.1\ \mu m$

37. The coupling lens of claim 34, wherein the optical pickup apparatus further comprises a third light source for emitting a third wavelength $\lambda 3$ which is different from the first and second wavelengths,

the objective lens unit converges a third light flux emitted from the third light source onto a third information recording surface of the third optical disk with different recording density from that of the first and the second optical disk,

the coupling lens is arranged in a common optical path of the first to third light fluxes,

the second wavelength $\lambda 2$ is in the range of 600 nm - 700 nm, the third wavelength $\lambda 3$ is in the range of 730 nm - 830 nm, and the chromatic aberration correcting optical unit satisfies one of the following combinations:

(n1, n2, n3) = (2, 1, 1), (4, 2, 2), (6, 4, 3), (8, 5, 4), (10, 6, 5)

where n1, n2 and n3 are diffraction orders of diffracted rays with largest diffraction efficiencies in diffracted rays when the fist, second and third light fluxes enter into the chromatic aberration correcting optical element, respectively.

38. The coupling lens of claim 37, wherein a refractive index for the first wavelength $\lambda 1$ of a lens constructing the chromatic aberration correcting optical element and including the diffracted surface is in the range of 1.5 - 1.6, Abbe number for d line (wavelength 587.6 nm) is the range of 50 - 60 and the depth d0 of a step which is along an optical axis and closest to the optical axis satisfies one of the followings:

(9) $1.2\ \mu m < d0 < 1.7\ \mu m$

(10) $2.6\ \mu m < d0 < 3.2\ \mu m$

(11) $4.4\ \mu m < d0 < 5.0\ \mu m$

(12) $5.6\ \mu m < d0 < 6.5\ \mu m$

(13) $6.9\ \mu m < d0 < 8.1\ \mu m$

39. The optical pickup apparatus of claim 38, wherein the coupling lens comprises at least one of a plastic lens and a diffractive surface of the chromatic aberration correcting optical element further has a function for suppressing a divergence angle variation in response to a temperature variation or a converging angle variation in response to a temperature variation for the first light flux emitted from the coupling lens.

40. The coupling lens of claim 39 which is one-group coupling lens and satisfies the following formulas:

$$\{NA1 \cdot (1 - m1)\}^4 \cdot (f1^2 / f_C) \cdot | c1 + (c2 - c1) \cdot P_D / P_C | < 0.13 \cdot \lambda 1$$

where NA1 is a numerical aperture of the objective lens unit at the time of information recording and/or representing on the first optical disk, m1 is a magnification of the objective lens unit at the time of information recording and/or representing on the first optical disk, f1 (mm) is a

focal length of the objective lens unit for the first wavelength $\lambda 1$ at the time of information recording and/or representing on the first optical disk, the first $\lambda 1$ (mm) is the first wavelength, f_C is a focal length for $\lambda 1$ of the coupling lens, n is a refractive index for the first wavelength $\lambda 1$ of the coupling lens, α is a linear expansion coefficient of the coupling lens, P_D (mm^{-1}) is a paraxial power of the diffractive surface for the first wavelength $\lambda 1$, P_C (mm^{-1}) is a paraxial power of the coupling lens for the first $\lambda 1$, $dn/d\lambda$ is a change rate in a refractive index resulting from a temperature variation in the coupling lens, $d\lambda/dt$ is a wavelength change rate resulting from the temperature variation, and c1, c2 and P_D are defined by the following formulas:

$c1 = 1 / (n - 1) \cdot dn/dt + 1 / (n -1) \cdot dn/d\lambda \cdot d\lambda/dt - \alpha$

$c2 = 1 / \lambda 1 \cdot d\lambda/dt - 2\alpha$

$P_D = -2 \cdot n1 \cdot B_2 \cdot (\lambda 1 / \lambda B)$

where n1 is a diffraction order of a diffracted ray with a largest diffraction efficiency among diffracted rays when the first light flux enters into the diffractive structure, wherein P_D is defined by an added optical path length

quantity caused by the diffractive structure which is represented by an optical path difference function satisfying the following formula:

$$\phi_b = n \times (\lambda / \lambda B) \times \sum_{j=0} B_{2j} h^{2j}$$

where h (mm) is a height in perpendicular direction to the optical path, $B2_j$ is an optical path difference function coefficient, n is a diffraction order of a diffracted ray with a largest diffraction efficiency among diffracted rays of an incident light flux, λ (nm) is a wavelength of an incident light flux to the diffractive structure and λB (nm) is a construction wavelength (or a blazed wavelength) of the diffractive structure.

41. The optical pickup apparatus of claim 40 which satisfies the following formula:

$$| c1 + (c2 - c1) \cdot P_D / P_C | / f_C < 0.08 \cdot \lambda 1 \text{ (mm)}$$

42. A chromatic aberration correcting optical element for an optical pickup apparatus comprising

a first light source for emitting a first light flux with a first wavelength λ1 of 450 nm or less;

a second light source for emitting a second light flux

with a second wavelength $\lambda 2$ which is 1.3 times longer than the wavelength of the first wavelength $\lambda 1$;

an objective lens unit to converge the first light flux emitted by the first light source onto a first information recording surface of a first optical disk and to converge the second light flux emitted by the second light source onto a second information recording surface of a second optical disk with a different recording density from that of the first optical disk,

wherein the chromatic aberration correcting optical element is arranged between both of the first light source and the second light source and in a common optical path of the first light flux and the second light flux,

the chromatic aberration correcting optical element comprises at least an optical surface with negative paraxial and is conducted the first light flux almost parallel to the optical axis and emits an almost parallel light flux;

comprises chromatic aberration correcting optical element which includes a diffractive surface on at least one of optical surfaces of the chromatic aberration correcting optical element such that a diffractive structure which is constructed by a plurality of ring-shaped zones separated by

fine steps is formed on the diffractive surface; and designed so that a diffracted ray with a diffraction order n2 having a largest diffraction efficiency among diffracted rays when the second light flux enters into the diffractive structure, has lower order than a diffracted ray with a diffraction order n1 having a largest diffraction efficiency among diffracted light rays when the second light flux enters into the diffractive structure.

43. The chromatic aberration correcting optical element of claim 42, wherein the diffractive structure is formed on a macroscopically flat optical surface and the opposite side of the optical surface has negative paraxial power and doesn't have the diffractive structure thereon.

44. The chromatic aberration correcting optical element of claim 42, wherein the second wavelength $\lambda 2$ is in the range of 600 nm - 700 nm and a combination of the diffraction order n1 and n2 is one of the followings:

(n1, n2) = (2, 1), (3, 2), (4, 2), (5, 3), (6, 4), (7, 4), (8, 5), (10, 6).

45. The chromatic aberration correcting optical element of claim 44, wherein a refractive index of a lens constructing the chromatic aberration correcting optical element and including the diffracted surface for the first wavelength $\lambda 1$ is in the range of 1.5 - 1.6, Abbe number for d line (wavelength 587.6 nm) is the range of 50 - 60 and the depth d0 of a step which is along an optical axis and closest to the optical axis satisfies one of the followings:

(1) $1.2\ \mu m < d0 < 1.7\ \mu m$

(2) $1.9\ \mu m < d0 < 2.6\ \mu m$

(3) $2.6\ \mu m < d0 < 3.2\ \mu m$

(4) $3.3\ \mu m < d0 < 4.2\ \mu m$

(5) $4.4\ \mu m < d0 < 5.0\ \mu m$

(6) $4.7\ \mu m < d0 < 5.7\ \mu m$

(7) $5.6\ \mu m < d0 < 6.5\ \mu m$

(8) $6.9\ \mu m < d0 < 8.1\ \mu m$

46. The chromatic aberration correcting optical element of claim 42, wherein the optical pickup apparatus further comprises a third light source for emitting a third wavelength $\lambda 3$ which is different from the first and second

wavelengths,
the objective lens unit converges a third light flux emitted from the third light source onto a third information recording surface of the third optical disk with different recording density from that of the first and the second optical disk,
the chromatic aberration correcting optical unit is arranged in a common optical path of the first to third light fluxes,
the second wavelength $\lambda 2$ is in the range of 600 nm - 700 nm,
the third wavelength $\lambda 3$ is in the range of 730 nm - 830 nm,
and the chromatic aberration correcting optical unit satisfies one of the following combinations:

(n1, n2, n3) = (2, 1, 1), (4, 2, 2), (6, 4, 3), (8, 5, 4), (10, 6, 5)

where n1, n2 and n3 are diffraction orders of diffracted rays with largest diffraction efficiencies in diffracted rays when the fist, second and third light fluxes enter into the chromatic aberration correcting optical element, respectively.

47. The chromatic aberration correcting optical element of claim 46, wherein a refractive index of a lens constructing

the chromatic aberration correcting optical element and including the diffracted surface for the first wavelength $\lambda 1$ is in the range of 1.5 - 1.6, Abbe number for d line (wavelength 587.6 nm) is the range of 50 - 60 and the depth d0 of a step which is along an optical axis and closest to the optical axis satisfies one of the followings:

(9) $1.2\ \mu m < d0 < 1.7\ \mu m$

(10) $2.6\ \mu m < d0 < 3.2\ \mu m$

(11) $4.4\ \mu m < d0 < 5.0\ \mu m$

(12) $5.6\ \mu m < d0 < 6.5\ \mu m$

(13) $6.9\ \mu m < d0 < 8.1\ \mu m$